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LUMINARY Memo # 122

To: Distribution
From: Dana Densmore
Date: 6 November 1969
Subject: LUMINARY Revisions 117-120

Change Incorporated into Revision 117

- 1) A patch was incorporated to fix the bug in R29 (Anomaly L-1B-02 - R29 could not lock-on). This was to allow a possible re-release of LUMINARY 1B.

Change Incorporated into Revision 118

- 1) A patch was incorporated in P22 to fix Anomaly L-1B-01, to allow possible re-release of LUMINARY 1B. Selection of P22 before the CSM had entered Mode 2 radar coverage could have resulted in an erroneous 530 alarm.

Changes Incorporated into Revisions 119, 120

- 1) Patches to correct L-1B-02 and L-1B-01 were removed.
- 2) A change was made in the pre-designate routine in P22 to fix Anomaly L-1B-01. A loop is used to determine when the CSM would pass inside the RR Mode II limits, incrementing the time integrated to by 10 seconds each pass through the loop. However, when the CSM was found not to be within the mode limits the branch was to the wrong place: it tried to come into the middle of a 2-op-code interpretive instruction. Control was transferred to the second operand. The missing operation was the one that commanded the increment. Therefore, the increment was never

done and on each pass the integration was done to the same time. This was corrected by expanding the instruction into two and branching to the second one on the decision.

- 3) R29 was changed to fix Anomaly L-1B-02. Formerly the TRUNNCMD erasable was used for both trunnion and shaft angles, causing R29 not to work. Now we pick up the value calculated for the shaft command and left in the erasable TANG and use that for subsequent shaft calculations.
- 4) A ZL instruction was inserted at "COMMEQS" in the 1/ACCS section so that a divide instruction would give the expected quotient in all cases. This was done to correct Anomaly L-1B-03. If the computed jet control authorities about the Q and R axes (1JACCQ and 1JACCR) had been equal, the quantity COEFFR would have been incorrectly determined with a resulting loss of control by the LM DAP around the vehicle Z axis. 1JACCQ and 1JACCR might have been equal on a future mission if the values of "HIDESCENT", the scaling of "MASS", or the coefficients used to compute 1JACCQ and 1JACCR as a function of mass were changed.
- 5) Coding was added in SPEEDRUN, called in SERVICER, to ensure that the RR Error Counters are enabled prior to display of forward and lateral velocities. This was to fix Anomaly L-1B-04. The anomaly was that T4RUPT removed the RR Error Counter Enable bit when the RR was cycled on and off, thus disabling the forward and lateral velocities sent to the X-pointers. The new coding checks for this bit every pass through the Landing Display Routines (four times per sec). If the bit is found to be off it branches to DISPRSET which reinitializes the X-pointers and exits via TASKOVER.
- 6) A CCS NEWJOB was added in TESTXACT to allow a waiting display to come up after the extended verb RELDSP. This was done to correct Anomaly LNY 92. The anomaly was that an extended verb over a normal nonflash cyclic display might have needed a key

release before it could get its first display up. This was because a sleeping cyclic display could have been awakened by the RELDSP in TESTXACT but not executed yet if the extended verb didn't do a CCS NEWJOB. It would then come up at ENDIDLE and cover the extended verb's display. In LUMINARY this anomaly could have caused a problem in V41 or V42 if they were keyed in after a display like V06N40 in P40.

- 7) N60 was changed to display forward velocity instead of non-directional horizontal velocity. The VHORIZ computations for N60 were deleted. FORVEL, the new quantity to be displayed, does not have to be computed. It is the speed at which the spacecraft is moving with respect to the moon's surface along the +Z (spacecraft) direction. (PCR 882)
- 8) R36 was changed to load TIG as the initial time value as the desired time of the computed out-of-plane parameters in N16 after the V90E. R36 formerly loaded all zeros as the initial time value. This was done because the crew usually loaded TIG then. (PCR 936. 2)
- 9) P76 was changed to set the NODOFLAG just after the proceed on the ΔV display, thus giving a 1520 alarm if a V37 is attempted during the integration. NODOFLAG is then reset on completion of integration. This precaution was added because if a V37EXXE was keyed in during P76's updating the CSM state vector for a burn while the integration was still going on it could destroy the update. (PCR 836. 2)
- 10) A UNIT instruction was added in P70/P71 preferred orientation logic to unitize UNFC/2 at ANG1CHEK. The rotation control sequence is used to prevent the body X-axis from pitching through the downward vertical ($-\bar{R}$) in achieving the desired thrust direction. The unit vector of this thrust direction was supposed to be compared with COSTHET1, a pad loaded erasable. The decision on this is currently always passed in the expected way because COSTHET1 is

currently pad-loaded zero. This change corrects the equation so that it will always behave as expected. (ACB L-5)

- 11) The SP erasable 1JACCV was deleted and a Transfer to Storage done to it in the 1/ACCS coding (the only reference to it) also deleted. 1JACCV was the acceleration expected from a single jet fired about the V axis. It is later used in TJETLAW but it is recomputed there. This change (ACB L-6) was made in order to make room for the fix to Anomaly L-1B-03.

Changes to LUMINARY GSOP:

Section 4 should reflect the changes described above in (5), (7), (8), and (9).

Section 2 should reflect the change described above in (9).

Note: The changes described were put into Revision 119. Revision 120 was made to correct mistakes and cusses. Revision 120 was GOOD.